ASP-VOCALS

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DOE G-1 Aircraft

G-1 Payload- Aerosol and Cloud Microphysics

Parameter	Instrument	Source
Aerosol Size distribution 0.1 – 3 μm	PCASP	PNNL
Aerosol size distribution 30 – 120 nm	FIMS	BNL
Aerosol concentration d> 10 nm	TSI 3010	PNNL
Aerosol concentration d> 3 nm	TSI 3025	PNNL
Cloud droplet and drizzle size distribution	DMT CAPS	BNL
Cloud liquid water content	Gerber Probe/CAPS Probe	PNNL/BNL

VOCALS Payload- Aerosol Properties

Parameter	Instrument	Source
Aerosol composition- soluble inorganic and organic species	PILS	BNL
Aerosol composition	Aerodyne ToF-AMS (high resolution)	BNL/PNNL/ Aerodyne
CCN	3 DMT CCN 1 dual, 2 single	BNL/PNNL
Aerosol extinction and backscatter	TSI 3λ Integrating Nephelometer	PNNL
Aerosol absorption	Photothermal	BNL

VOCALS Payload- Trace gases

Parameter	Instrument	Source
O_3	Thermo Electron 49-100 Fast O_3 sensor	BNL BNL
CO	UV Fluorescence	BNL
SO_2	Thermo Electron 43S modified	BNL
DMS/Organics	PTRMS	PNNL

Aircraft Operations

- Deployment- One Month in the field between October 15 and November 15, 2008. Arriving ~ October 10
- Flight hours- Between 60 and 70 research hours
- Flight Schedule- Base schedule is a 4 hr flight every other day. If needed, flights can be made every day for several days in row, or multiple flights can be made on a single day. Such operations will need to be followed by a hard down day.
- Aircraft endurance and range- Endurance is ~4 hrs at an airspeed of 200 kts, for an approximate range of 800 nm.

Flight Plans

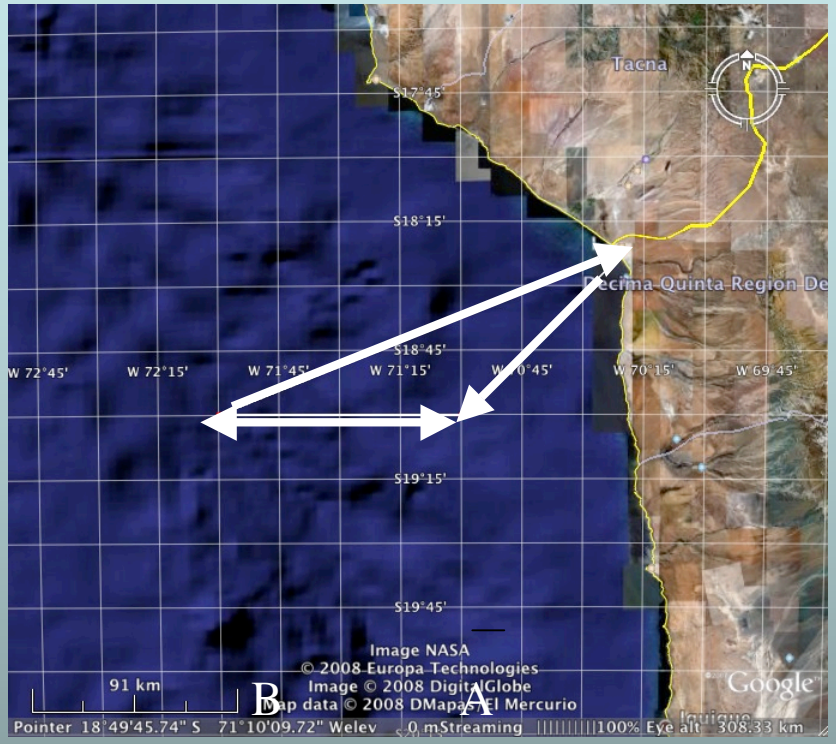
Basic flight strategy-

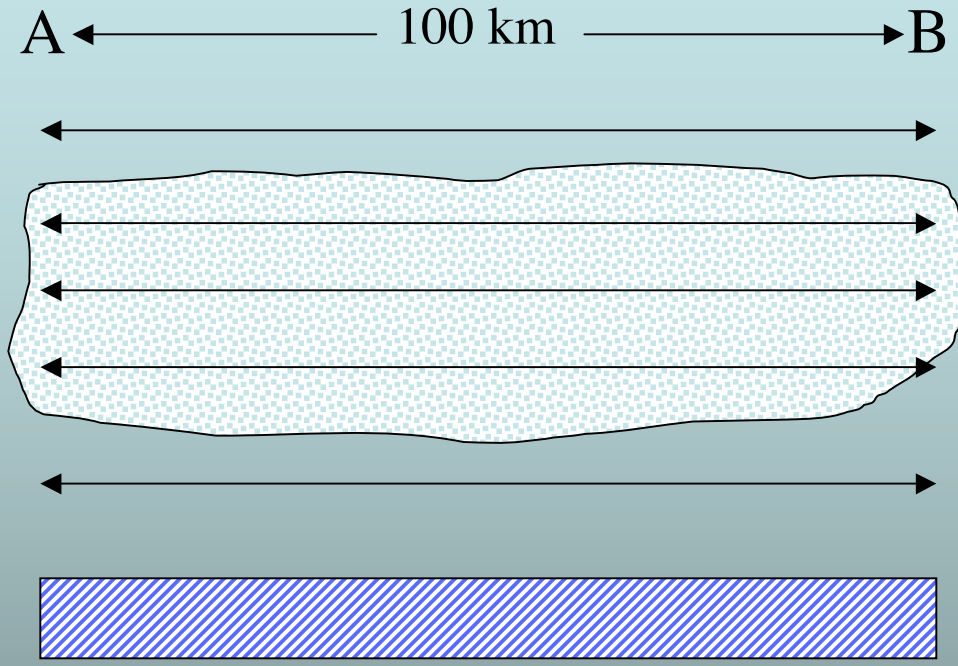
1. Below cloud leg(s) to measure aerosol composition, size distribution, CCN spectra, vertical velocities and their variability.

2. Multiple altitude in-cloud legs to measure measure cloud microphysical properties and their variability both with respect to location and altitude.

3. Above cloud leg to characterize chemical and microphysical properties of above cloud air.

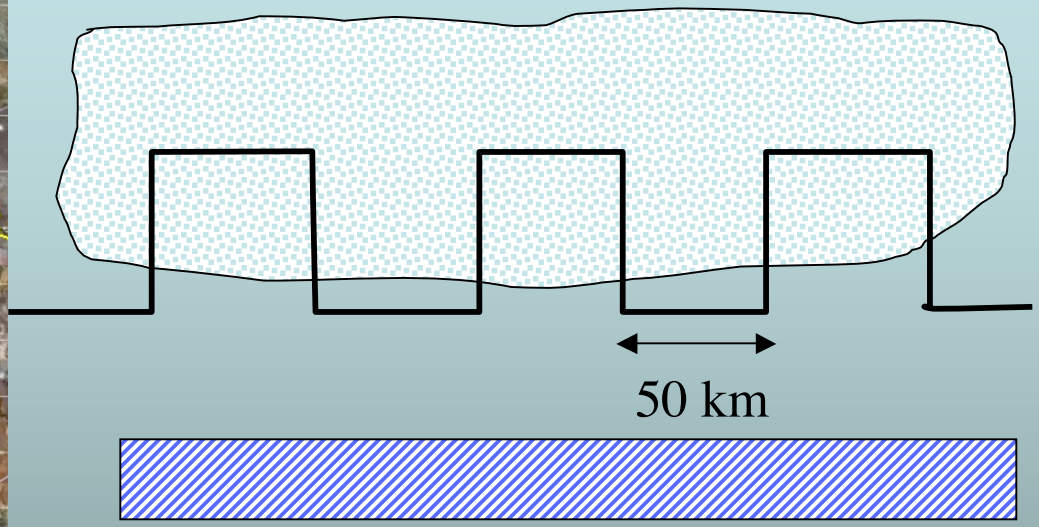
Basic Flight Plan

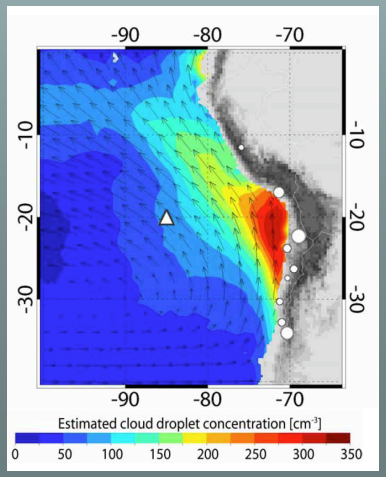




Strategy of basic flight plan is to get statistically meaningful data on properties of clouds and the conditions under which they were formed by by flying ~100 km legs below-, in- and above-cloud. Flights can be made at any location consistent with the range and endurance of the aircraft.

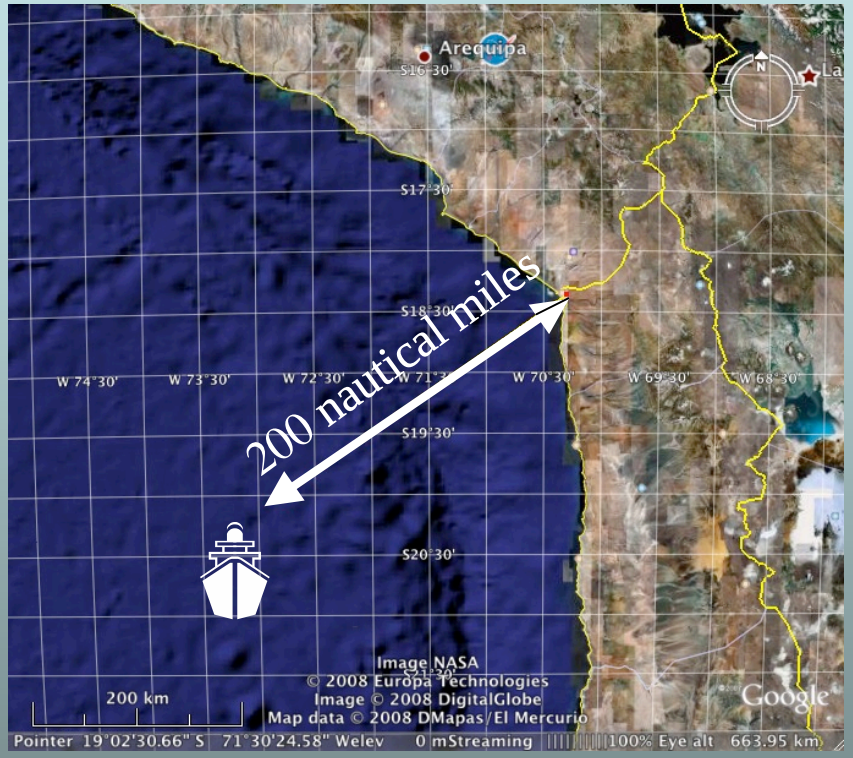
Gradient Flight Plan

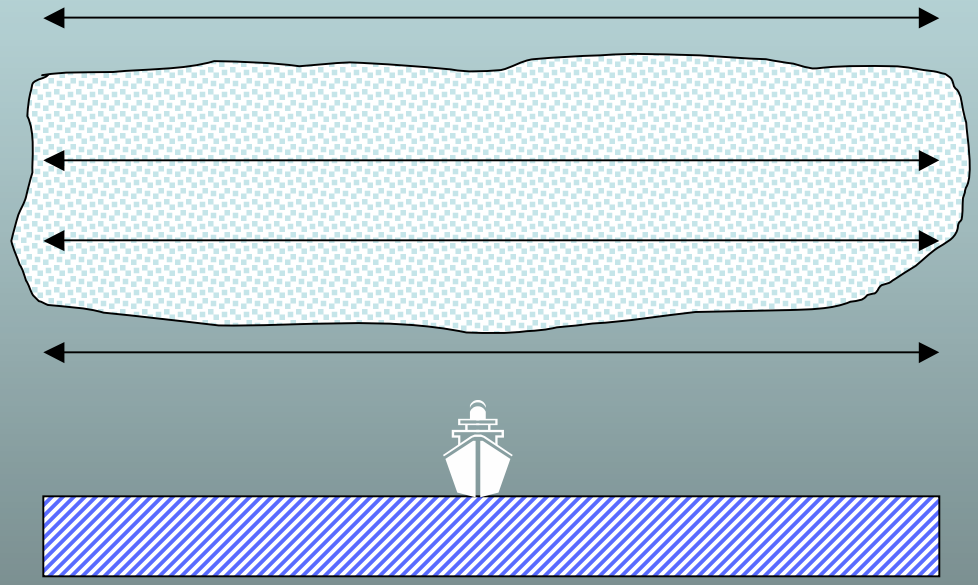




Objective is to characterize gradient in CCN and cloud microphysical properties that has been inferred from satellite measurements. Such flight plans may be profitably coupled with flights of the other aircraft, to enhance the gradient being sampled.

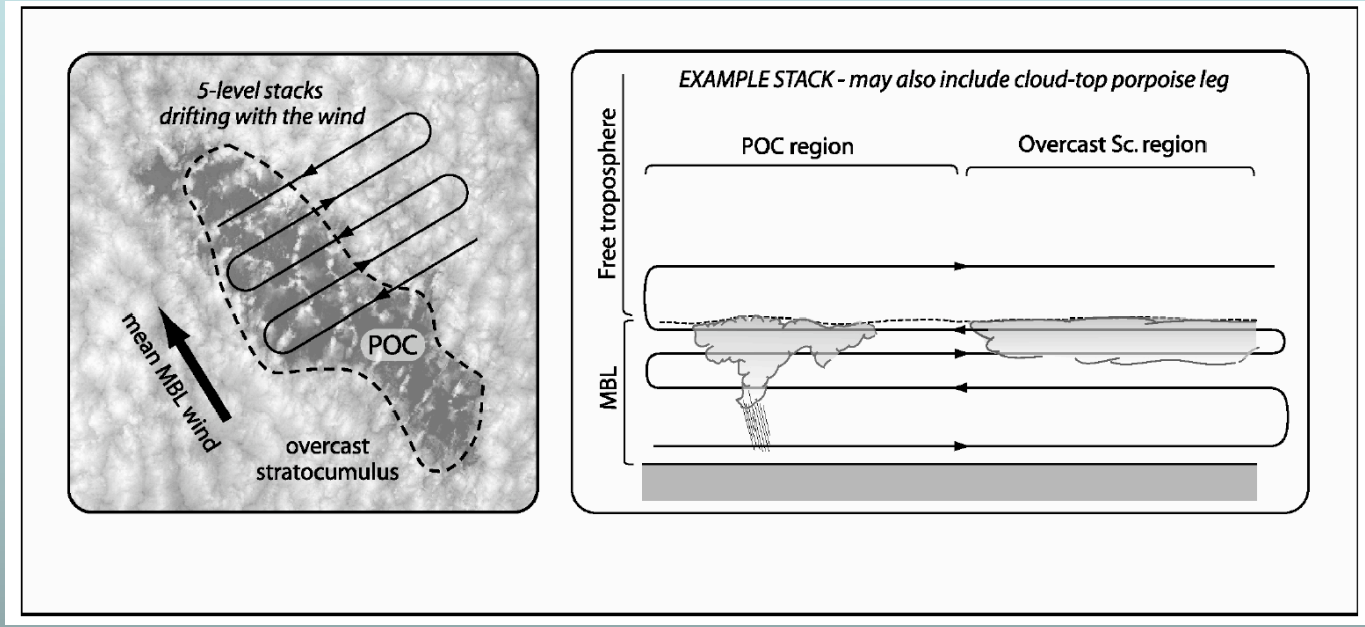
Overpass of the Ron Brown





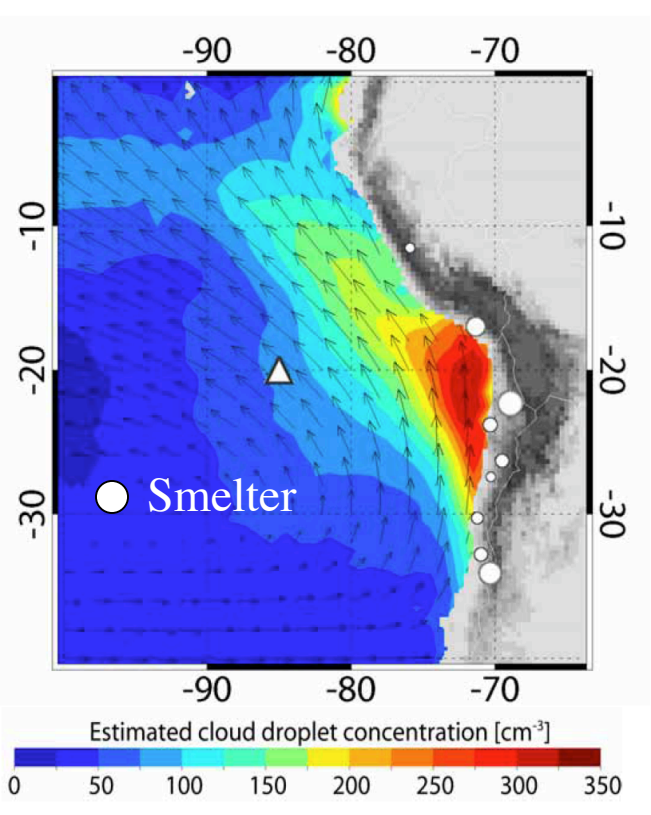
For G-1 Flight to be useful, Ron Brown must be within 200 nautical miles of Arica. This allows 1 hr transit, 2 hrs sampling above the Ron Brown, and 1 hr transit back to Arica.

Pockets of Open Cells (POC) Flight Plan



POC flights will occur primarily in collaboration with the C-130, which will locate cells and conduct initial sampling. POC's must be within ~200 nautical miles of Arica for useful sampling to be conducted.

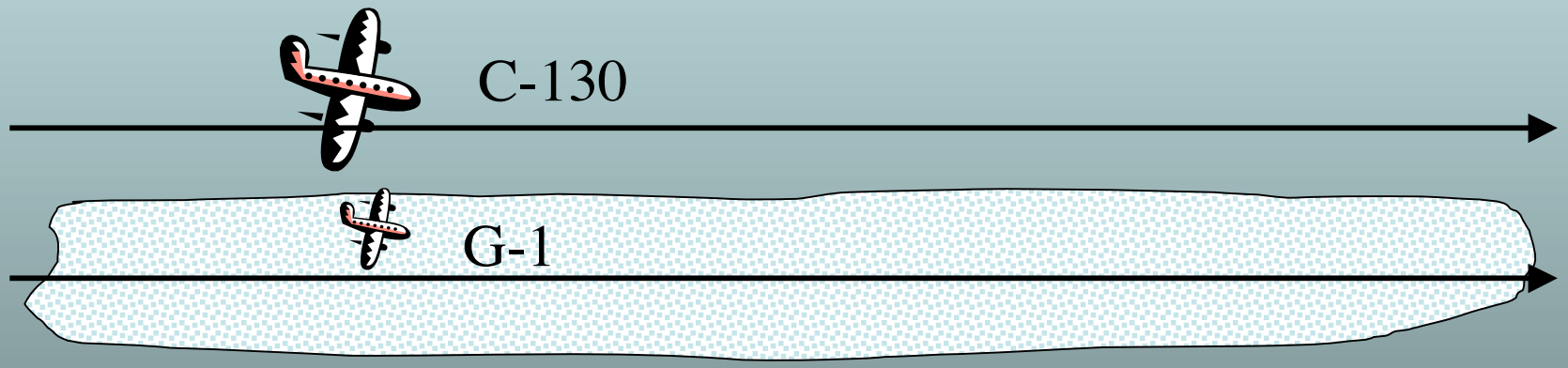
Smelter Plumes Flight Plan



Under appropriate flow conditions, characterize in- and out-of plume cloud properties. Vertical profiles to obtain information on entrainment. Deploy aircraft so as to implement Lagrangian sampling of the smelter plume. Could involve as many as 4 aircraft.

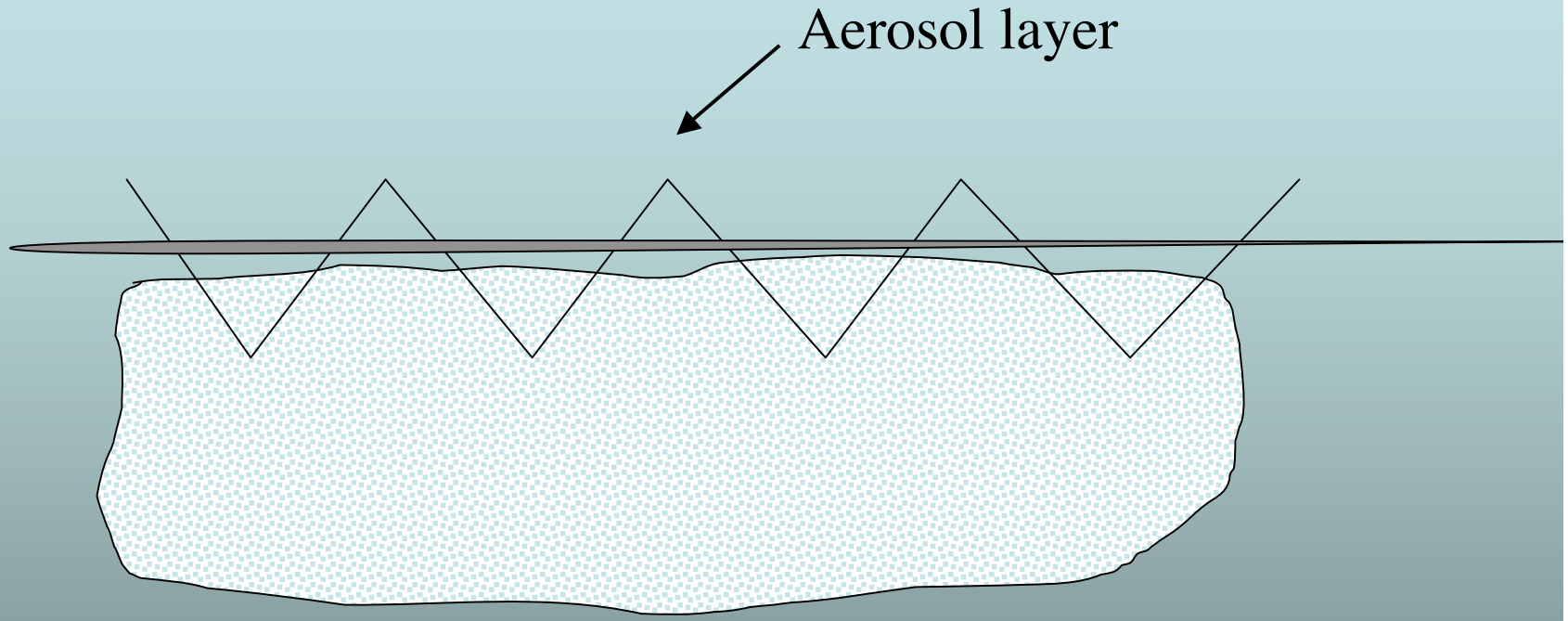
Joint Flights

Joint flights with other aircraft are highly desirable. Especially useful are flights that combine remote sensing of cloud properties with in-situ measurements. Shown below is an example for the G-1 and the C-130. Similar flight plans could be conducted with the Twin Otter and the British Aerospace 146.



Objective of these flights is to link remote sensing measurements of cloud properties by the C-130 to in-situ cloud properties measured by the G-1. Of interest are C-130 cloud radar, and radiation fields measurements. Such flights are planned to be conducted towards the end of the C-130 flights within about 200 nm of the coast.

Sampling the Interface between cloud-top and the free troposphere



Determine whether aerosol layer observed just above cloud-top off the coast of California during MASE is also seen in VOCALS.